

Attachment 4. Project Description

The Sacramento Suburban Water District (SSWD) will develop an improved monitoring network to provide information necessary to develop tools to manage a regionally-extensive occurrence of perchlorate contamination in groundwater in the Arden-Arcade District, Sacramento County near the American River. Detectable concentrations of perchlorate have been measured in wells immediately upgradient of SSWD's supply wells. Previous modeling efforts have identified potential transport of perchlorate contamination on a regional scale traveling into SSWD's service area. This project seeks to evaluate the reality of that projected contaminant transport to proactively develop a management tool to address continued transport of contaminants to supply wells and protect the water quality within the basin.

The goal of the study is to improve the understanding of contaminant transport and the predicted impact to the region water supply in the Arden-Arcade district and great regional water supply. The project will achieve this goal by:

- Installing additional monitoring wells to characterize lateral and vertical extents of impact or at a minimum provide sentry monitoring locations,
- Conducting aquifer testing to identify interconnectivity of specific water bearing zone and their roles in contaminant transport,
- Evaluating perchlorate concentration temporal changes in these monitoring wells over the period of performance and beyond, and
- Utilizing this information to develop a refinement of the existing groundwater model to aid in predictive proactive management of the SSWD well operations and contaminant transport.

These actions will provide a sound management tool that will directly address components of the Sacramento Groundwater Authority's (SGA), of which SSWD is a member, groundwater management plan (GWMP) specific goals of protecting regional water quality to maintain sustainability with the groundwater resource. The model developed will provide a lasting long-term tool to manage operations and direct future conservation and resource management efforts.

About Sacramento Suburban Water District

SSWD's mission is 'to deliver a high quality, reliable supply of water and superior customer service at a reasonable price.' SSWD's objectives in support of this mission include managing SSWD's groundwater supply to ensure its quality and quantity; and maximizing the use of existing system capacity to generate revenues to offset other system costs. Historically, SSWD has primarily used groundwater as its water supply source. SSWD started significantly supplementing its groundwater supply with surface water in 1998 to address the declining groundwater table using in-lieu recharge. The District has made significant investments to put surface water supply and conjunctive use facilities in place. Its existing infrastructure and

regional water resources needs place the District in a key position to help support regional conjunctive use efforts as well as meeting its own needs.

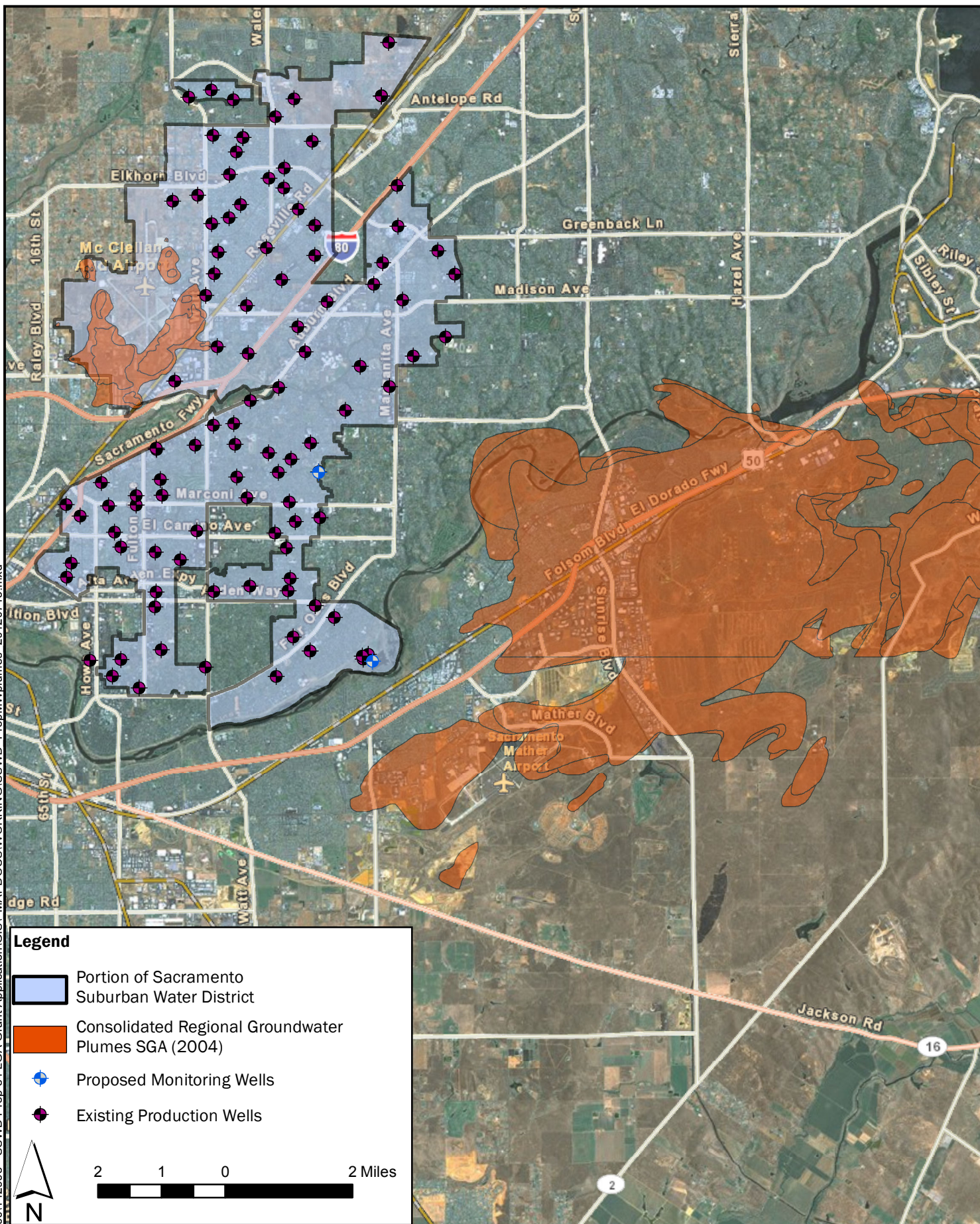
The District serves a population of approximately 160,000 in Sacramento County. Within the District are four service areas. Water supply for the District is currently derived from active groundwater wells and surface water from Placer County Water Agency and the City of Sacramento. The District's groundwater supply infrastructure has a total groundwater pumping capacity of 98,390 gallons per minute (gpm) from 89 active wells. Figure 1 presents the general study area and SSWD's service area. Wells throughout the District are generally between 200 and 1,300 feet deep and draw water primarily from the Mehrten formation. The older, shallower wells typically produce up to 1,000 gpm. Some of the newer wells produce over 2,500 gpm.

SSWD is a member agency of the Sacramento Groundwater Authority (SGA). The SGA is a groundwater management agency formed in 1998 to manage the groundwater basin underlying Sacramento County north of the American River. As part of its groundwater management mission, SGA has developed many tools and completed many projects over the years to ensure sustainability of the groundwater basin as a critical element of the historic Sacramento region Water Forum Agreement of 2000 to promote the coequal objectives of water supply for the region through 2030 and protection of the environment of the lower American River.

Concern Addressed by the Proposed Project

On June 20, 2011, the SGA presented a discussion of groundwater contamination to SSWD staff. The presentation included the results of a vulnerability study that modeled potential movement of known contaminant plumes in the greater Sacramento Area. The modeling started with the location of the existing perchlorate plume, and then used particle tracking analysis to predict where the plume was moving. The modeling showed that the perchlorate plume was moving directly towards SSWD's service area, and moving through portions of SSWD's service area. Figures 2 and 3 show snapshots of the modeling results. In both figures, the green triangles are SSWD's production wells, and the tan round dots are representative of particles of perchlorate. Figure 2 shows the particles moving towards SSWD in 2028. Figure 3 shows the particles moving into SSWD's service area in 2049.

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BROWN AND
CALDWELL

PROJECT	142993
DATE	7-13-2012

SITE	Sacramento Suburban Water District
TITLE	General Study Area

Figure	1
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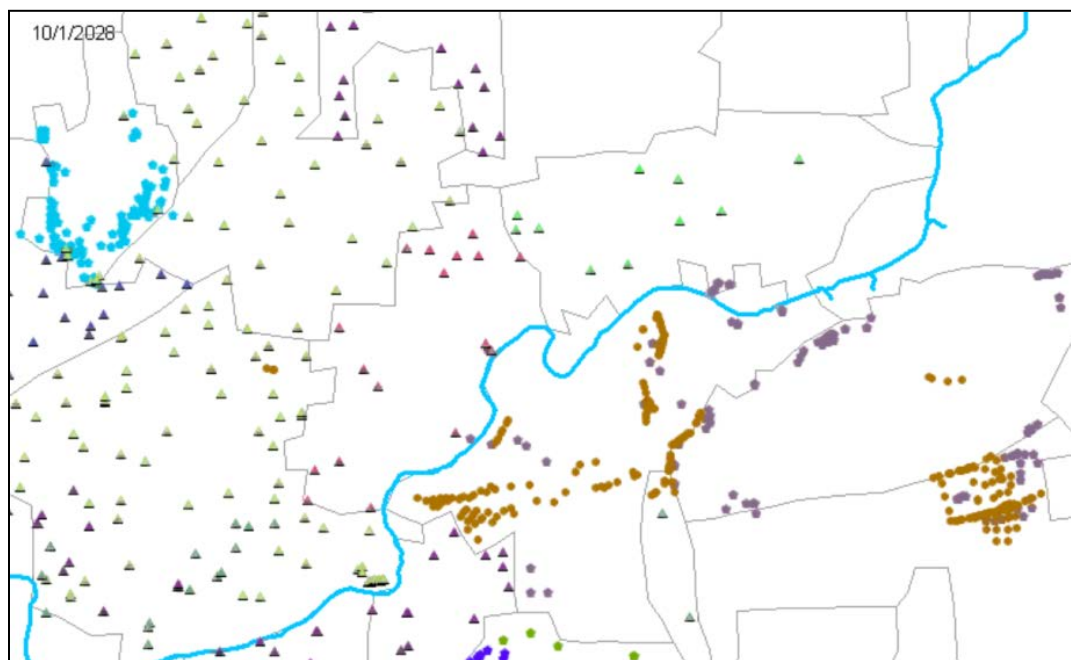


Figure 2. Perchlorate Plume Particle Tracking

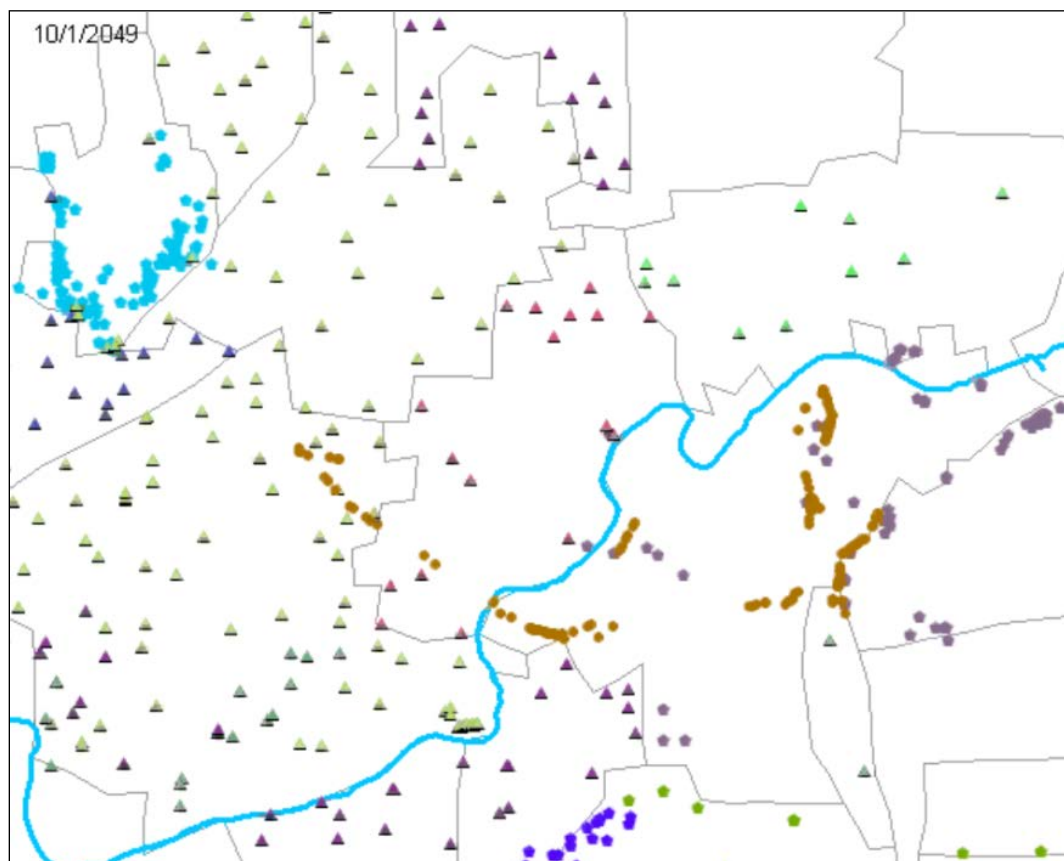


Figure 3. Perchlorate Plume Particle Tracking

Project Goals

There are three primary project objectives of the project as described further below.

1. **Better define the presence of perchlorate near SSWD's service area.** This is necessary because the understanding of the perchlorate plume near SSWD is not well known. The work will help to better understand whether the perchlorate has migrated into the areas where no data is currently available and then provide an early warning system in cases where perchlorate is not currently present. Better defining the presence of perchlorate and potential flow pathways will be accomplished through construction of new multi-completion monitoring wells and sampling of the monitoring wells to provide both vertical and lateral definition
2. **Better understand groundwater conditions in the areas predicted to be impacted by perchlorate.** To effectively manage the groundwater basin with the continued presence of perchlorate, it is valuable to understand aquifer properties and interconnectivity of specific flow pathways. Utilizing the geologic logs of the new monitoring wells and aquifer testing results, the local hydrogeology and aquifer properties will be better defined for use in the refined groundwater model. The refined groundwater model with this new data will drastically improve understanding of the movement of groundwater near SSWD's southeastern boundary.
3. **Better define where the perchlorate could go given recent groundwater extraction patterns.** To most effectively mitigate against potential future impacts, it is important to estimate where the perchlorate could end up in the future. Groundwater modeling with the improved data from geologic logs and aquifer testing will be used to identify the most likely future pathways of perchlorate with predicted SSWD groundwater extraction operations.

Project Components

The project will consist of the following elements as described briefly below and in detail in the work plan in the following section of this application.

1. **CEQA Documentation, Permitting and Access.** This task provides CEQA compliance, and acquires the appropriate permits for installation of monitoring wells. CEQA compliance and County permits are essential for project execution, because they are required by law.
 2. **Installation of Groundwater Monitoring Wells.** This task involves the installation of two triple completion monitoring wells. The location of these wells will be within the southern portion of SSWD's service area, and these locations have been selected to be sentry wells to detect the presence of perchlorate, which has been detected in water supply wells upgradient of SSWD wells. Monitoring well installation and analysis provides detailed geologic logs and information with identification of formation contacts for assessment of preferential flow pathways controlling the movement of perchlorate, interactions between aquifer systems, and depth specific water quality data. These wells will be added to the California Statewide Groundwater Elevation Monitoring (CASGEM)
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system to provide water level data for the region and will also provide critical data for the refinement to regional groundwater models.

3. **Groundwater Sampling.** This task involves the sampling of the two newly installed nested monitoring wells (total of six individual monitoring points) installed for this project on a quarterly basis for one year. As discussed above for installation, these locations have been selected as sentinel wells for early detection of perchlorate impacts known to exist upgradient of the SSWD's production well fields. Information obtained from this task will include an assessment of existing perchlorate impacts relative to selective stratigraphic zones, seasonal variations of identified impacts, and an overall view of the fate and transport of any identified current impacts. Other parameters will be measured to assess interactions between aquifer zones, and establish the current groundwater quality conditions so that changes in water quality due to migration of upgradient impacts during future sampling events can be assessed
4. **Aquifer Testing.** A key component of this project will be the assessment of the interactions, or connections, between permeable zones above and within the zones screened by current production wells. Understanding these connections is critical for assessing the pathways that water and associated chemical contaminants actually flow through the groundwater system and for developing the conceptual model used for construction of the groundwater analytical model. Aquifer testing will provide localized estimates of aquifer parameters such as transmissivity (T), storativity (S), specific yield (Sy), effective radius (Ro), and effective capture zone dimensions of the pumping wells that will be used for refinement of the groundwater model described in Task 5.
5. **Groundwater Contaminant Fate and Transport Modeling.** Groundwater modeling will be conducted in order to predict the potential future flow paths of the perchlorate plume. The groundwater model will incorporate data collected from the monitoring wells to improve local hydrogeologic understanding. Data will be collected and incorporated into the numerical model framework where appropriate, and the model will be refined to a scale appropriate to simulate the transport of the perchlorate plume. Predictive model runs will be developed to describe future transient groundwater flow conditions. Particle tracking will be performed to estimate perchlorate movement. Finally, the results will be compared and documented in a modeling report.
6. **Project Management.** Project management will include activities such as project team coordination, budget and schedule tracking, quarterly reports, and other efforts as needed to complete the project scope of work on schedule and budget.

Project's relationship to the Region's Groundwater Management Plan

SSWD is a member agency of the SGA, and falls under the 2008 SGA GWMP included in Attachment 3. The proposed project is directly related to the primary goal of the 2008 SGA GWMP "to ensure a viable groundwater resource for beneficial uses including agricultural, industrial, and municipal supplies that support that support the Water Forum Agreement's co-equal objectives of providing a reliable and safe water supply and preserving the fishery, wildlife, recreational, and aesthetic values of the lower American River." This goal cannot be met without a sustainable groundwater basin.

Long Term Need for Project

Perchlorate has been identified as a large regional problem in the greater Sacramento area, as shown in Figure 1 above, and has already significantly impacted operations in this part of the basin. It is critical to understand the extent, and preferential pathways of the contaminant to allow groundwater producers the ability to change operations or identify remediation opportunities.

Collaboration

There has already been significant demonstrated collaboration on the project as it has been by SGA. The SGA leads collaboration in groundwater in the region where SSWD operates. During project execution, SSWD will coordinate with the SGA, Central Valley Regional Water Quality Control Board, and Sacramento County EMD as the responsible regulatory bodies in the basin with respect to contamination. Updates will be provided to the SGA Board of directors at bi-monthly meetings. These meetings are publicly noticed and include elected and appointed representatives of each of SGA's member public water suppliers, as well as an appointed representative of agriculture and other independent groundwater users in the SGA area.

New Knowledge and Improved Management

The proposed project will add significant new knowledge to our understanding of groundwater, aquifer parameters, and understanding of the movement of perchlorate. The new monitoring points and updated contaminant transport model will be important tools for understanding the current status of perchlorate and serve as ongoing management tools as the region confronts this issue.

Ongoing Use of Project

SSWD will continue to use the monitoring wells and model into the future. The monitoring wells will be added to the SGA managed California Statewide Groundwater Elevation Monitoring (CASGEM) program for water levels. The monitoring wells are available for additional water quality monitoring, and the model will be used in the future as pumping regimes change. Collected data will be shared with the water suppliers in the basin for their information in determining how to best produce groundwater from the basin in a manner that is sustainable. Finally, SGA will maintain the updated contaminant transport model as part of its ongoing groundwater management responsibility.
